

MEMORANDUM



MWH

MWH
2353 130th Avenue N.E., Suite 200
Bellevue, Washington 98005
Phone: (425) 602-4000
Fax: (425) 867-1970

To: Rick Clegg, IDEQ

cc: Bob Geddes, Monsanto

From: Bill Wright and Mark Rettmann, MWH

Date: July 8, 2004

Reference: P₄ Production Southeast Idaho Mine-Specific Selenium Program (1010076.011601)

Subject: *Subtask 4d–Agronomic testing of unreclaimed, poorly reclaimed, and well reclaimed land of the Ballard Mine site investigation (SI)*

Introduction

The purpose of this technical memorandum is to document the findings of the June 2004 field reconnaissance of Ballard Mine and to present the randomly selected locations to be sampled for this subtask, *Subtask 4d–Agronomic testing of unreclaimed, poorly reclaimed, and well reclaimed land*. This subtask supports the site investigation at P₄ Production's Ballard Mine. The purpose of the reconnaissance was to visually identify and roughly map three types of reclaimed areas at Ballard Mine: unreclaimed, poorly-reclaimed, and well reclaimed areas. See Attachment A for photos referred to in this memorandum.

Reconnaissance

A field reconnaissance of Ballard Mine was conducted on June 21, 2004. The reconnaissance involved visually surveying waste rock dumps and mining areas, including mine pits and backfilled mining areas, to identify them as one of the three types of reclaimed areas. Table 2–2, *Ballard Mine–Facilities Inventory*, from the Ballard Mine Engineering Evaluation/Cost Analysis Work Plan presented, in part, below lists the facility names and station numbers of mine pits and waste rock dumps surveyed at Ballard Mine. Refer to Figure 1–1, *Ballard Mine Facility & Sampling Locations*, for locations of the facilities.

TABLE 2-2 BALLARD MINE – FACILITIES INVENTORY		
Type of Facility	Facility Name	Station Number
Mine Pit	Ballard Mine Pit #1	MMP035
	Ballard Mine Pit #2	MMP036
	Ballard Mine Pit #3	MMP037
	Ballard Mine Pit #4	MMP038
	Ballard Mine Pit #5	MMP039
	Ballard Mine Pit #6	MMP040
Waste-Rock Dump	Ballard Mine Pit #1 Overburden Dump #1	MWD080
	Ballard Mine Pit #1 Overburden Dump #2	MWD081
	Ballard Mine Pit #3 Overburden Dump	MWD082
	Ballard Mine Pit #4 Overburden Dump	MWD083
	Ballard Mine Pits #5 and #6 Overburden Dump	MWD084
	Ballard Mine Pit #2 Overburden Dump	MWD093

The reconnaissance was documented in the project field book and the reclamation type and general location of each identified area was hand drawn on a field map (i.e., on Figure 2-1 of the programmatic field sampling plan). The three types of reclaimed areas were identified using the following rationale:

- unreclaimed (UR) – areas with no vegetation or very sparse vegetation growth;
- poorly reclaimed (PR) – areas with sparse to moderate vegetation growth compared to densely vegetated areas; and,
- well reclaimed (WR) – densely vegetated areas.

Each type of reclaimed area identified at Ballard Mine was assigned an identification number consisting of the abbreviation for the type of reclaimed area (UR, PR, or WR) and a sequential two digit number beginning with 01 for each type (i.e., UR01, PR01, WR01).

The results of the reconnaissance for Subtask 4d are described below.

- MWD084: Located in the NE portion of Ballard Mine, N, NE, and E of MMP039. All areas of this waste rock dump appeared to be densely vegetated with various grasses and alfalfa (WR01). See Photos 1, 2, and 3.
- MMP039: Located in the NE portion of Ballard Mine near MWD084. The pit base, disturbed areas, and backfilled areas of the pit all seemed to have very little (none to very sparse) vegetation growth (UR01). Some trees were observed growing in some pit/backfill areas. The soil color was predominately black or light black and the soil appeared to consist of fine grains. See Photos 4, 5, and 6.

MWD082: Located in the E and SE portion of Ballard Mine. All of the MWD082 waste rock dump, except five localized areas, appear to be densely vegetated with grasses and alfalfa (WR02), especially the main portion of the waste rock dump to the E, SE, and S of the MMP037 pit. See Photos 7, 8, and 9.

The first area of MWD082 that is not well reclaimed is a backfilled pit area/waste rock area that is located N of the MMP037 pit and E of the gravel road. This area appeared to be mostly a bare area with very little vegetation growth, some sparse plants present, but no grass or alfalfa was observed growing in this area (UR02). The UR02 area was a flat area on top of the waste rock dump and consisted of white, tan, and black shales (mostly lighter shales). Note, the side-hills and slopes of this area facing N and E appeared to be fairly well vegetated (densely vegetated) with grasses and alfalfa. See Photo 10 and 11.

The second area of MWD082 that is not well reclaimed is the portion of the waste rock dump that is located immediately west of the MMP037 pit, and west of the gravel road, is fairly well vegetated (densely) except the E facing slope that is uphill (west) of the gravel road. This slope area has sparse to moderate vegetation consisting of grasses and alfalfa (PR01). The angle of this slope is steep and appears to consist mainly of tan shales. See Photo 12.

The third area of MWD082 that is not well reclaimed is located near the first gravel road split off at the SW corner of MMP037, south of the PR01 area. This area appears to have no vegetation to sparse vegetation growth consisting of grasses and alfalfa (UR03). See Photo 13.

The fourth area of MWD082 that is not well reclaimed is located between PR01 and UR03 at the second gravel road split off at the SW corner of MMP037. This small area is located approximately 200 meters down the gravel road leading left at the second split in the gravel road. This area is a small area of black shales that appears to have no or very sparse vegetation growth (UR04). See Photo 14.

The fifth and final area of MWD082 that is not well reclaimed is the portion of the waste rock dump that is located E of MMP040. The top and side slopes of this area appears to have mostly sparse to moderate vegetation growth (PR02). Note, there is a large area of bushes and shrubs growing on a portion of the top of this area. See Photo 15.

- MMP040: Located in the east-central portion of Ballard Mine. The MMP040 area is a small pit located S of MMP039 and W of PR02. The pit and backfilled areas of the pit appear to have no vegetation to sparse vegetation growth (UR05). Some sparse alfalfa growth was observed in this area, especially on low areas and terraces. See Photos 16 and 17. Further up the road through MMP040 is another area that appears to be the N end of MMP036 and is discussed below. See Photo 18.
- MMP036: Located in the central portion of Ballard Mine. The pit, backfilled, and disturbed areas appeared to have no vegetation to sparse vegetation growth in most areas (UR06). See Photos 18 and 19.
- MWD093: Located in the central portion of Ballard Mine, W and NW of MMP036. This waste rock dump appears to be backfilled or placed in a mine pit, possibly part of MMP036 mine pit. The lower and upper elk ponds appear to be located on waste rock/mining areas of MWD093 or MMP036. The main portion of the waste rock dump N and NW of the elk ponds appears to be moderately vegetated with grass and alfalfa (PR03). Photo 20. Some areas, especially the areas surrounding the elk ponds and side slopes, appear to have no vegetation to sparse vegetation (UR07). See Photos 21 and 22.
- Unmapped Waste Rock Dump: Located E of MMP035, also N, NE, and E of MSG003 (Garden Hose Spring), and W of MWD093 the waste rock dump. This waste rock dump does not appear to be mapped on the Figure 2-1. This dump may be part of MWD093, but it may be just incorrectly mapped. Overall, the waste rock dump appears to moderately to densely vegetated (WR03), especially on the top of the waste rock dump, while the side slopes appear to be moderately vegetated (PR04). See Photo 23.
- MMP035: Located in the W portion of Ballard Mine. The pit area and backfilled areas appear to have no vegetation to very sparse vegetation (UR08). See Photos 24 and 25.
- MWD080: Located in the NW and W portion of Ballard Mine. All of the MWD080 waste rock dump, except four localized areas, appear to be well vegetated (moderately to densely) with mostly grasses (less alfalfa than other areas of Ballard Mine) and the experimental reclamation planted trees and shrubs (WR04). See Photo 26.

The first area of MWD080 that is not well reclaimed is located at the S end of MWD080, just N to NW of the Ballard Mine shop building. The area is on the north (left) side of the gravel road leading to the mine pit (MMP035). The area appeared to have no vegetation to very sparse vegetation (UR09) and the soils consisted of black, tan, and white shales. See Photo 27.

The second area of MWD080 that is not well reclaimed is located N of UR08. From UR08, the gravel road splits to the N and S. Taking the road to the N, the area is located on the west side of the gravel road. The small area appears to have almost no vegetation (UR10) and the soil consists mainly of black and tan shales. See Photo 28.

The third and fourth areas of MWD080 that are not well reclaimed are located on the west slope of the waste rock dump along the haul road. One area of sparse to moderate vegetation (PR05) is located on the west slope of the waste rock dump S of the dredge pond. See Photo 29. The other area of sparse to moderate vegetation (PR06) is located on the west slope of the waste rock dump N of the dredge pond. See Photo 30.

- MWD081: Located in the SW portion of Ballard Mine. All of the MWD081 waste rock dump, except one localized area, appears to be densely vegetated with grasses and alfalfa (WR05). See Photo 31.

The one area of MWD080 that is not well reclaimed is located at the S to SW end of the MMP035 pit on the N side of the gravel road. The area has no vegetation to sparse vegetation with some sparse alfalfa and grasses (UR11). See Photo 32.

- Unmapped Waste Rock Dump: Located E of the S end of MMP035, the waste rock dump is not mapped on the Figure 2–1. The monthly vegetation plot for Ballard Mine is located at the top of this waste rock dump that is also located NW of MSP011 (the S elk pond). The area is densely vegetated with grass and alfalfa (WR06). See Photo 33.
- MWD083: Located S, SE of MWD081. This small waste rock dump appears to have mostly no to very sparse vegetation, especially on the steep side slopes that characterize most of the dump (UR12). Stream MST069 originates as a dump seep from the toe of this dump. See Photo 34.

In summary, most waste rock dumps at Ballard Mine, especially the tops of waste rock dumps, appear to be well reclaimed while some side slopes of waste rock dumps are unreclaimed to poorly reclaimed. Areas of black shales and dense shales on waste rock dumps or in mine pits appear to be unreclaimed to poorly reclaimed. Mine pit areas and backfilled waste rock in pits, especially black soil areas, appear to be mostly unreclaimed to poorly reclaimed.

Selection of Sampling Locations

Three locations from each of the three types of reclaimed areas were randomly selected using the random number generator feature of Excel.

Table 1, *Summary of Reclamation Reconnaissance*, below summarizes the results of the reconnaissance and lists the three types of reclaimed areas identified.

TABLE 1 SUMMARY OF RECLAMATION RECONNAISSANCE	
Type of Reclaimed Area	Location
UR01	MWP039
UR02	MWD082
UR03	MWD082
UR04	MWD082
UR05	MMP040
UR06	MMP036
UR07	MWD093
UR08	MM0035
UR09	MWD080
UR10	MWD080
UR11	MWD080
UR12	MWD083
PR01	MWD082
PR02	MWD082
PR03	MWD093
PR04	unnamed waste rock dump east of MMP035
PR05	MWD080
PR06	MWD080
WR01	MWD084
WR02	MWD082
WR03	unnamed waste rock dump east of MMP035
WR04	MWD080
WR05	MWD081

The three randomly selected unreclaimed areas are UR02, UR06, and UR09. The three randomly selected poorly reclaimed areas are PR02, PR05, and PR06. The three randomly selected well reclaimed areas are WR01, WR02, and WR04. These nine areas will be sampled in July 2004 as discussed below under the Sampling and Analysis Procedures section.

Sampling and Analysis Procedures

Sampling procedures for this subtask will be in accordance with documentation from the P₄ Production Southeast Idaho Mine-Specific Selenium Program that has been published in 2004, including the programmatic sampling and analysis plan (SAP), project-specific work plan (PjtWP) for Ballard Mine, and the project-specific field sampling plan (PjtFSP) for Ballard Mine. Specifically, sampling procedures are detailed in the programmatic field sampling plan (PgmFSP), programmatic quality assurance plan (PgmQAP), both of which are contained in the SAP. No sieving in the field will be performed.

Data quality objectives, rationale, and other related information regarding this subtask can also be found in appropriate sections of the Ballard Mine PjtWP, PjtFSP, and the programmatic SAP.

The soil samples will be analyzed at the ACZ Laboratory in Steamboat Springs, CO, for the analytes and methods indicated in Table 6–5, *Ballard Mine–Agronomic Soil Analytes*, of the PgmFSP found in the SAP and presented below.

TABLE 6-5 BALLARD MINE—AGRONOMIC SOIL ANALYTES			
Analyte	Method	Detection Limit	Units
Cadmium, extractable	M6010B ICP	0.005	mg/Kg
Calcium, soluble	M6010B ICP	0.2	meq/L
Cation Exchange Capacity	USDA No. 60 (19)	0.3 meq/ 100 g	-
Chromium, extractable	M6010B ICP	0.01	mg/Kg
Copper, extractable	M6010B ICP	0.01	mg/Kg
Conductivity at 25C	M120.1 – Meter with Saturation Paste Prep	0.001	mmhos/cm
Iron, extractable	M6010B ICP	0.01	mg/Kg
Magnesium, soluble	M6010B ICP	0.2	meq/L
Manganese, extractable	M6010B ICP	0.005	mg/Kg
Molybdenum, extractable	M6010B ICP	0.01	mg/Kg
Nickel, extractable	M6010B ICP	0.01	mg/Kg
Nitrate/Nitrite as N, (KCl)	M353.2 – Automated Cadmium Reduction	0.1	mg/Kg
Nitrite as N, (KCl)	M353.2 – Automated Cadmium Reduction	0.05	mg/Kg
Nitrogen, ammonia (KCl)	M350.1 – Automated Phenate	0.1	mg/Kg
pH, saturated paste	USDA No. 60 (21A)	0.1	standard units
Phosphorus, extractable	M365.1 – Automated Ascorbic Acid	0.01	mg/Kg
Potassium, soluble	M6010B ICP	0.3	meq/L
Selenium, extractable	SM3114 B, AA Hydride	0.001	mg/Kg
Sodium, soluble	M6010B ICP	0.3	meq/L
Sulfate, soluble	M375.3 Gravimetric	50	mg/Kg
Texture (particle size)	ASTM D 422 Hydrometer	0.1	%
Total organic carbon	ASA No.9 29-2.2.4 Combustion/IR	0.1	%
Vanadium, extractable	M6010B ICP	0.005	mg/Kg
Percent Solids	CLPSOW390, PART F, D-98	0.1	% solids
Zinc, extractable	M6010B ICP	0.01	mg/Kg
<p>Note:</p> <p>Agronomic soil samples will be air dried at 34C (USDA No.1, 1972) and sieved–2.0mm, or 0.5mm for Organic Matter analysis (ASA No.9, 15-4.2.2) and the appropriate extraction performed according to the analysis method.</p> <p>“Extractable” refers to the AB-DPTA Extraction (ASA No.9, 3-5.2.3)</p> <p>“Soluble” refers to the water extraction (ASA No.9 10-2.3.2)</p> <p>“KCl” refers to the potassium chloride extraction (ASA No.9 33-3.2.2)</p> <p>“Saturated paste” refers to a preparation method (USDA No.9, 60 [2])</p>			

Reporting

The sample results, and findings of the *Subtask 4d–Agronomic testing of unreclaimed, poorly reclaimed, and well reclaimed land*, will be reported in the SI report.

Attachment A



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Attachment A



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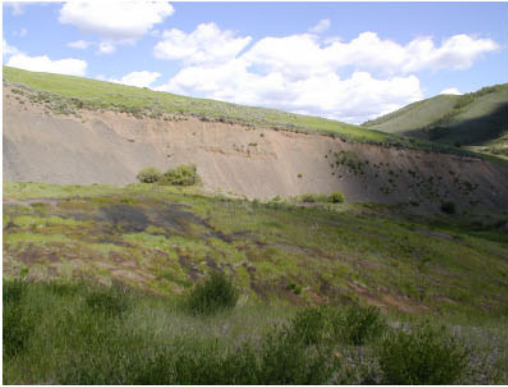


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16

Attachment A



17



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Attachment A



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